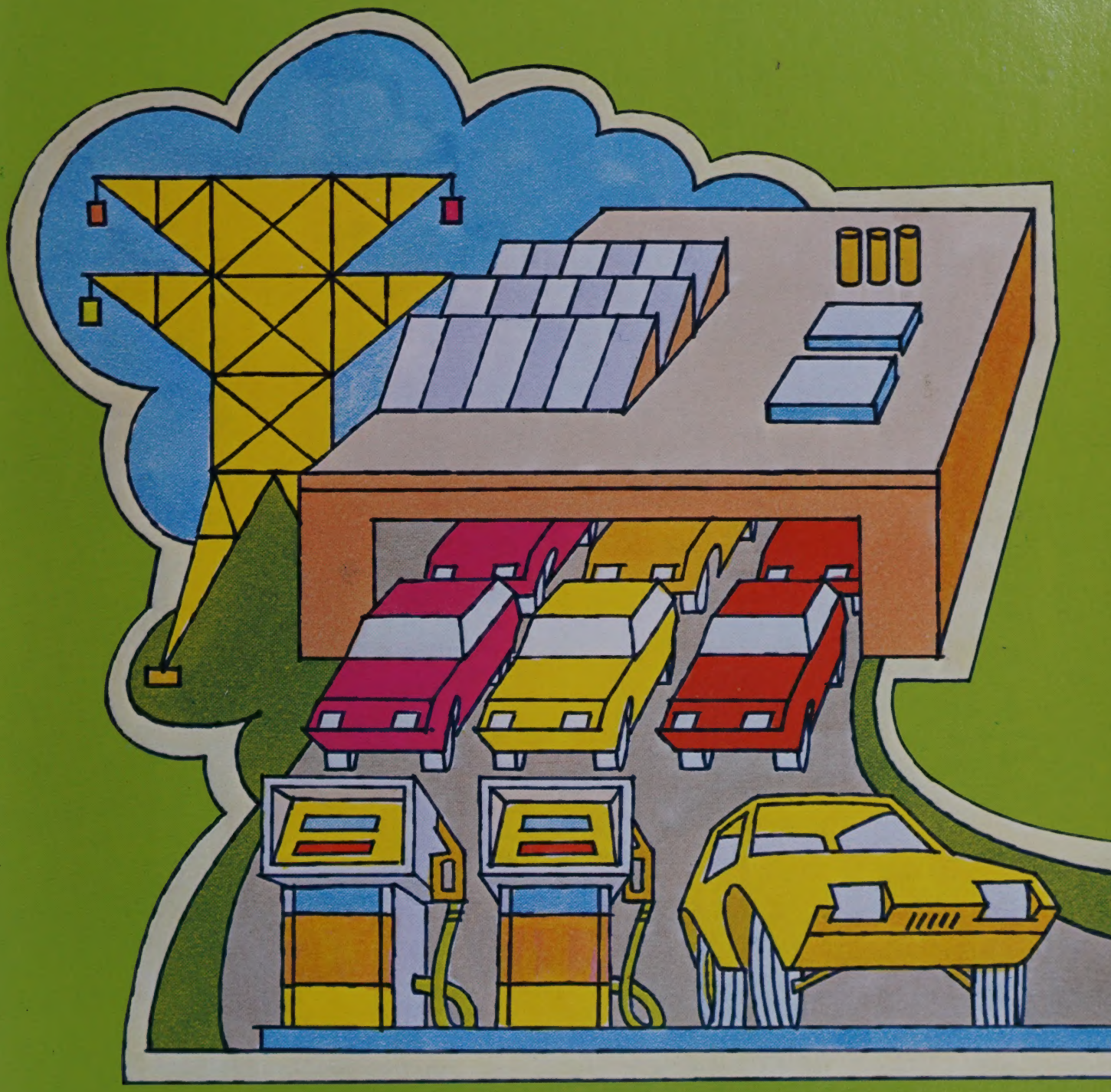

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Printing History
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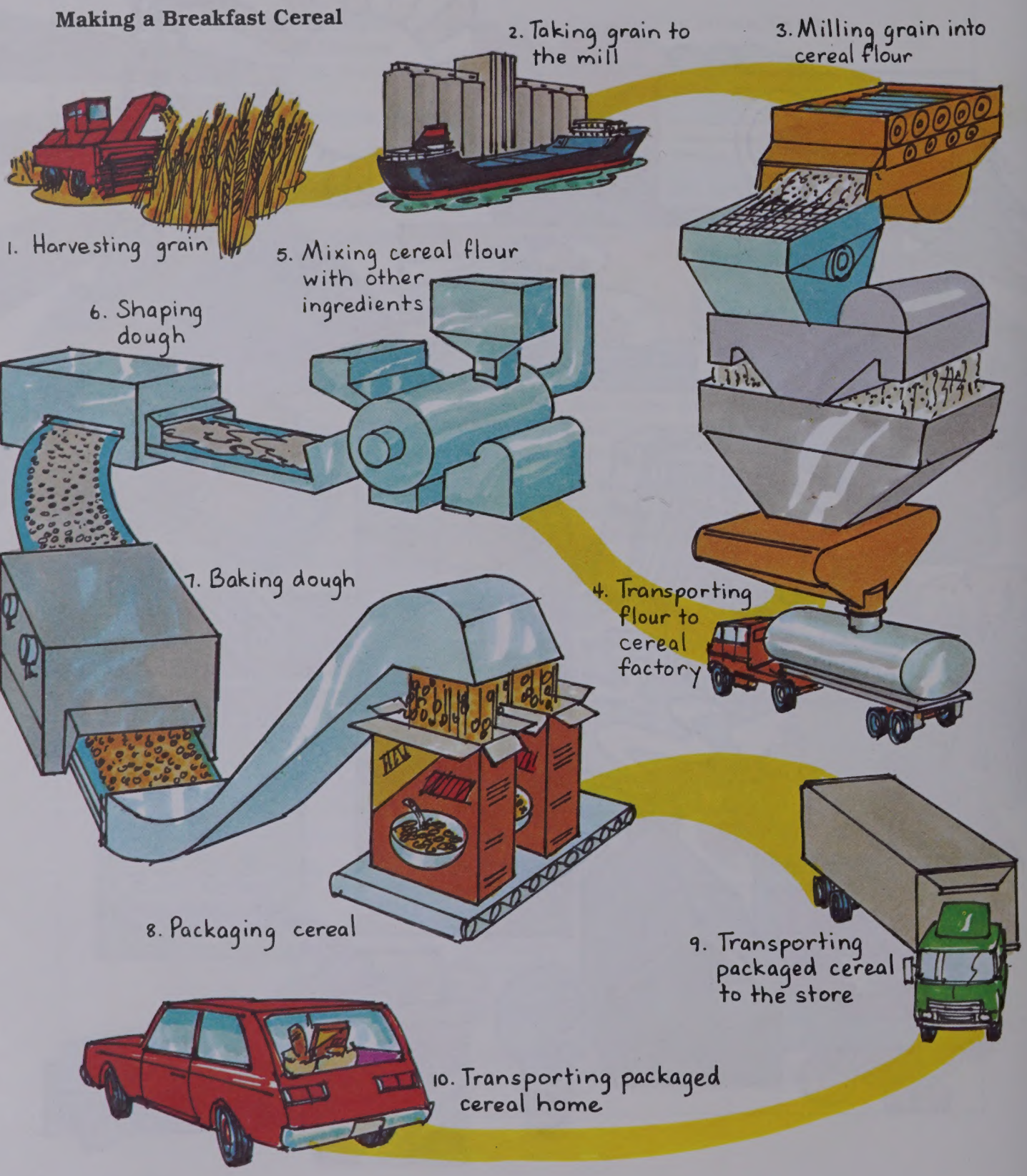
ACTIVITY 1

Energy: The Sun

ACTIVITY 2

Energy Users in the Kitchen

Making a Breakfast Cereal

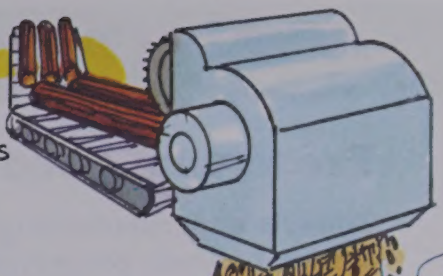

1. Harvesting grain
2. Taking grain to the mill
3. Milling grain into cereal flour
4. Transporting flour to cereal factory
5. Mixing cereal flour with other ingredients
6. Shaping dough
7. Baking dough
8. Packaging cereal
9. Transporting packaged cereal to the store
10. Transporting packaged cereal home

Making a Cereal Package

1. Cutting trees

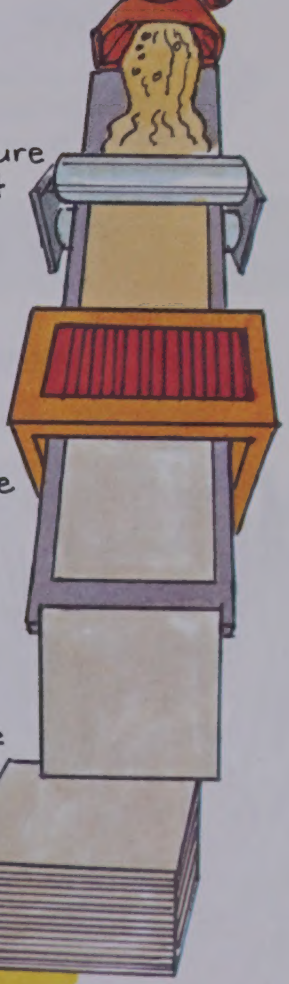
2. Transporting trees

3. Chopping trees into small chips



4. Cooking chips in hot liquid

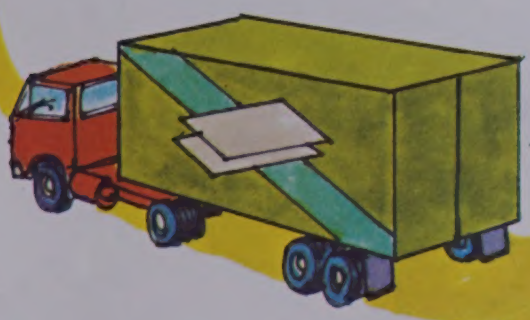
5. Pouring mixture and rolling it flat



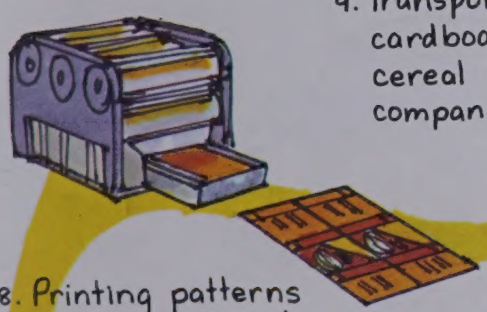
6. Drying mixture

Dried mixture is now flat sheets of cardboard

7. Transporting cardboard to box company



8. Printing patterns on the cardboard sheets



9. Transporting printed cardboard to cereal company

10. Stamping out and folding printed cardboard into boxes

11. Adding cereal

12. Sealing package

13. Transporting package to the supermarket

ACTIVITY 3

Preserving Food: Then and Now

Today's supermarkets offer a wide choice of foods preserved by freezing, canning, and other methods. Food-preserving, however, is not new. Centuries ago, people discovered that dehydrated, or dried, food would stay fresh for months.

The North American Indians made a highly nutritious food called pemmican. They dried buffalo meat in the sun and pounded it to a powder. This was mixed with melted buffalo fat and allowed to set into cakes. Sometimes berries were added to make it tastier.

These pemmican cakes helped the Indians through the long, harsh winters. They were also useful when the Indians journeyed. European explorers in North America later came to depend on pemmican during their long trips.

Answer these questions:

1. What is the oldest method of preserving food?
2. Who ate pemmican?
3. What is pemmican made of?
4. Why were berries sometimes added to pemmican?
5. Name two modern methods of preserving food.

Write the meaning of the following words. Use your dictionary if you wish.
discover, dehydrate, harsh, nutritious, pounded, preserve

ACTIVITY 4

Our Throwaway World

Could this mess have been avoided?

The Throwaway Bottle

Figures show energy costs at each step.

ACTIVITY 5

Waste From Packaging

Another Point of View
George Sullivan

Vocabulary: *salvage*

Packaging wastes are a problem. It is now thought that the average North American household throws out about a tonne of trash each year. The packaging industry admits that it is one part of the problem. But it points out that reducing some forms of packaging would not do away with the waste problem.

Take frozen french-fried potatoes, for example. The potatoes are washed by machine, then "lye-peeled." Lye, also known as caustic soda, "burns" the peel off. It's a good method because it wastes less than does peeling the potatoes with a knife. The waste is used as cattle feed. After the potatoes are sliced, they are fried. Freezing and packaging follow.

When the potatoes are to be eaten, the buyer just reheats them. The only waste is the pouch.

Had the buyer peeled and trimmed the potatoes, the waste would have ended up in what is called the solid-waste system. Solid waste is trash. It's anything dumped in the garbage can.

"Each year," says a recent study, "the food-processing industry salvages over 70% of its waste. If . . . foods were not processed and packaged, the peels, husks, pits, cobs, and the like would still have to be removed. They would be removed in homes or restaurants." In other words, there would be no opportunity to use the waste.

Packaged processed foods keep wastes down because spoilage is reduced. Some fruits and vegetables spoil in the time it takes to get them from the field to the stores.

Most food plants are at or near the growing areas. Fruit and vegetables are quickly taken to the plant. Losses because of spoilage are rare.

The food processor also helps to reduce waste by using odd-sized, undersized, or imperfect fruits and vegetables. They usually end up as juices.

One way that the packaging industry is helping to reduce the waste that does occur is by better package design. The best-known example is the reusable bottle, jar, or plastic tub. An empty ice-cream tub often winds up as a storage tub in the refrigerator. Still, reusable tubs are not going to solve our garbage problem.

The packaging industry believes that it is not the proper target of those concerned with the problems of the daily amounts of trash. The packaging industry says it would be better to improve the ways we get rid of our trash.

Packaging wastes are only a part of the garbage a family throws out each year. But they are a big enough part to have angered many people. In some places, citizens have voluntary recycling depots.

People bring waste items with salvage value to these depots. A few industries are supporting these efforts. They buy the salvage. But such efforts are only a beginning. Most of the items that make up solid wastes are not recycled.

The convenience of packaging is one of the features of our way of life. The price we pay is a growing amount of trash. So far there are few signs that people wish to change things. And there is the industry itself. The makers of paper, cans, glass, plastics, and all the rest don't want to produce less.

The answer to the waste problem probably lies in better ways of handling waste materials. But less packaging? It's not likely.

This is what we buy.

This is what we throw away.

Answer these questions:

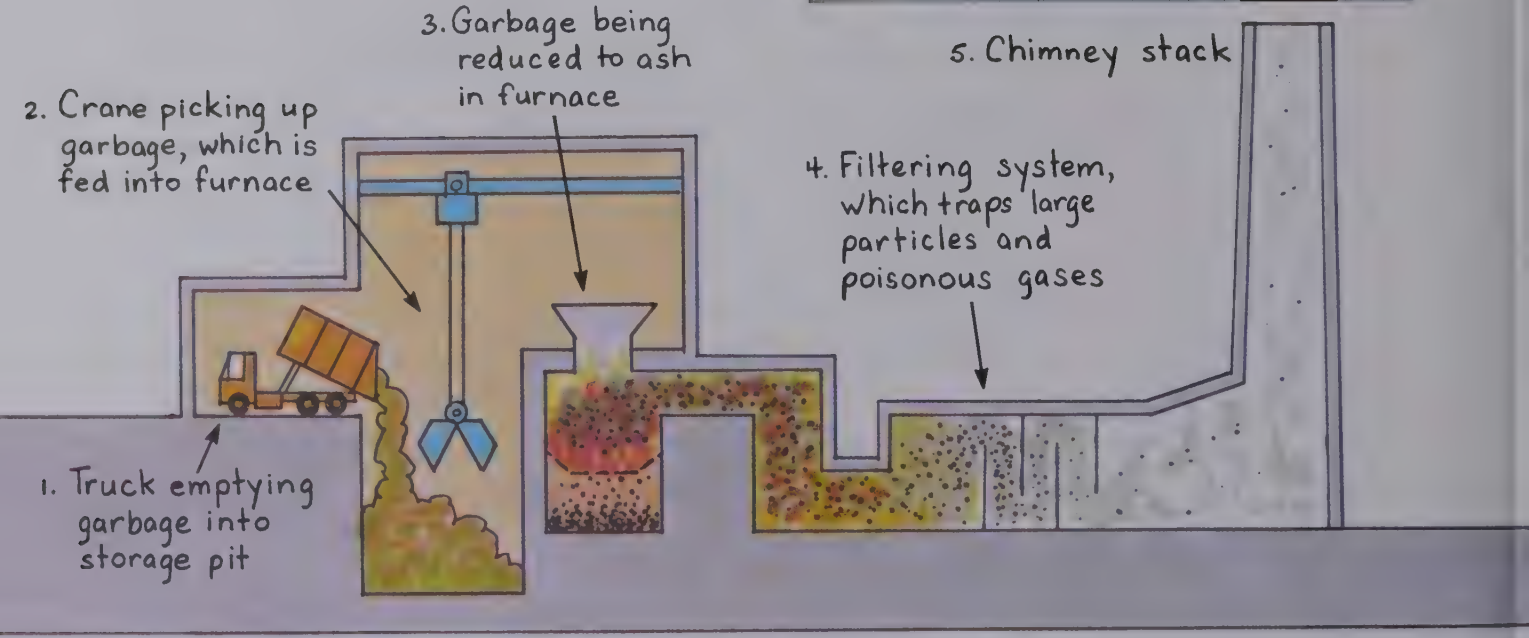
1. State how potatoes are processed into frozen french fries.
2. What happens to most of the waste in food-processing plants?
3. Give three ways that processed foods help to keep wastes down.
4. Give an example of good package design and state why you think it is a good design.
5. How does the packaging industry think we should deal with our trash?
6. What are recycling depots?
7. Why does the writer think we will not change our packaging methods? Do you think he is right in believing this?

ACTIVITY 6

Down in the Dumps

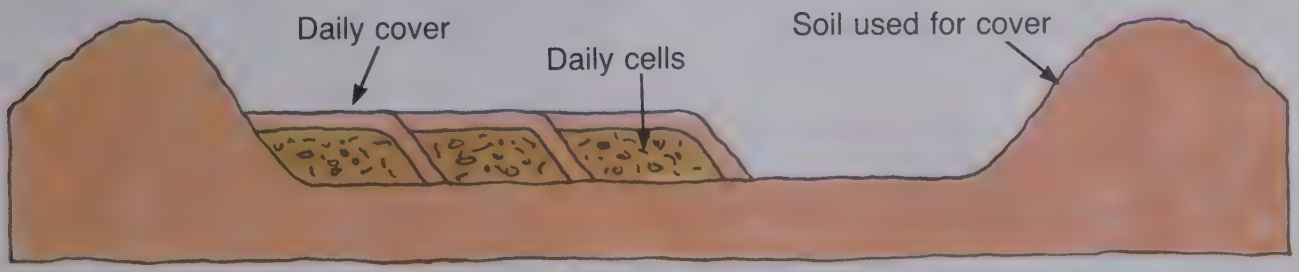
An Incinerating Plant

The incinerator is a very hot furnace. It reduces most forms of solid waste to ash. Special equipment is needed to control the gases that are given off. This adds to the costs of the incinerator.

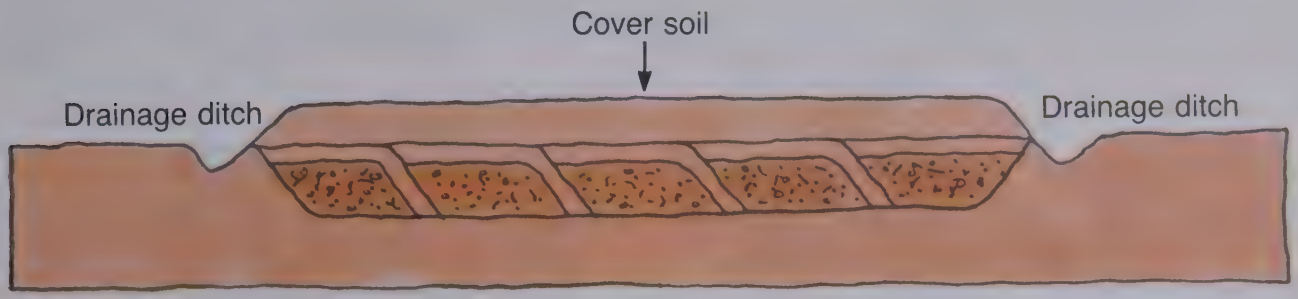

3. Garbage being reduced to ash in furnace
5. Chimney stack
2. Crane picking up garbage, which is fed into furnace
4. Filtering system, which traps large particles and poisonous gases
1. Truck emptying garbage into storage pit

Landfill Sites

Waste can be buried in landfill sites. As the trucks bring the garbage in, huge bulldozers bury the garbage. Care must be taken to make sure that underground water is not polluted by liquid garbage wastes seeping into the soil. As the waste rots, methane gas is produced. Care must be taken with this gas, too, because it catches fire easily. After about twenty years, a landfill site can be used to make a park or ski area.



Sanitary-Landfill—Operating Site



Completed Landfill Site — Twenty Years Later

ACTIVITY 7

Waste Not — Want Not

Obtaining Eggs on the Farm 150 Years Ago

How are the eggs packaged?
Is the packaging reusable?
Is anything wasted?

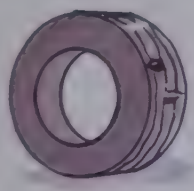
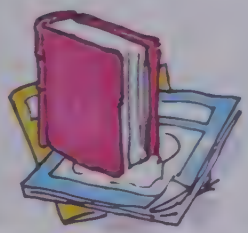
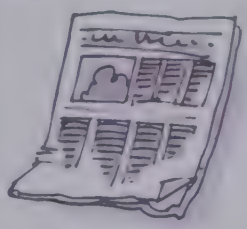
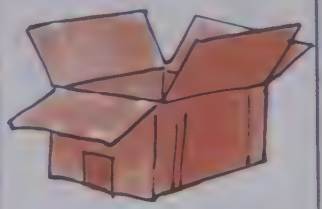
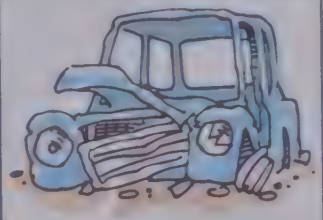
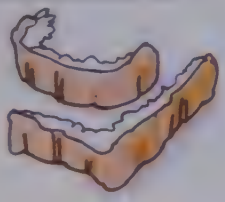
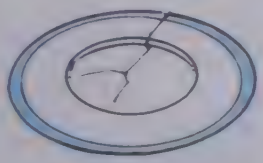
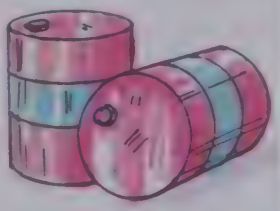
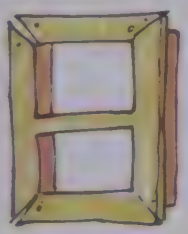
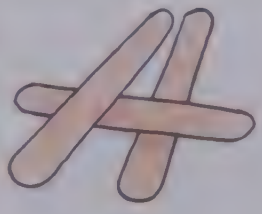
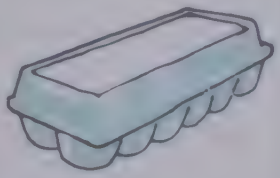
Obtaining Eggs in the City Today

How are the eggs packaged?
Is the packaging reusable?
Is anything wasted?

ACTIVITY 8

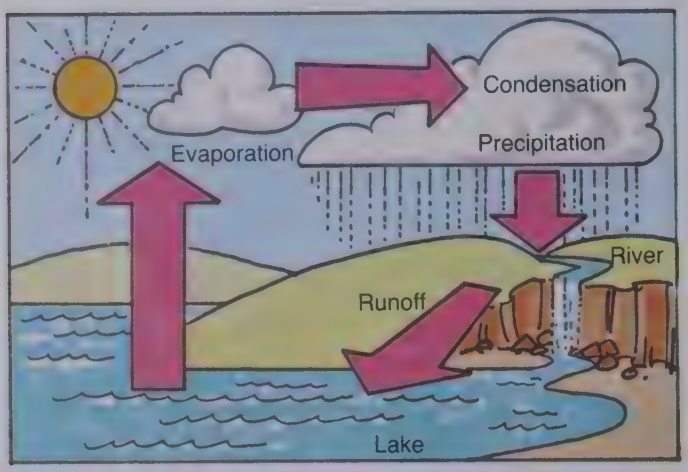
Conserve by Reusing

How can these things be reused to save energy?

 Rubber tires	 Books and magazines	Paper or plastic bags	 Newspaper
Clothes hangers	Jars and tin cans	 Cardboard boxes	String
Old clothes	Used envelopes	Knitted clothing	 Old cars
 Crusts of bread	 Cracked plates	Bathtub	 Barrels
Old barn	 Window frames	 Popsicle sticks	 Egg cartons

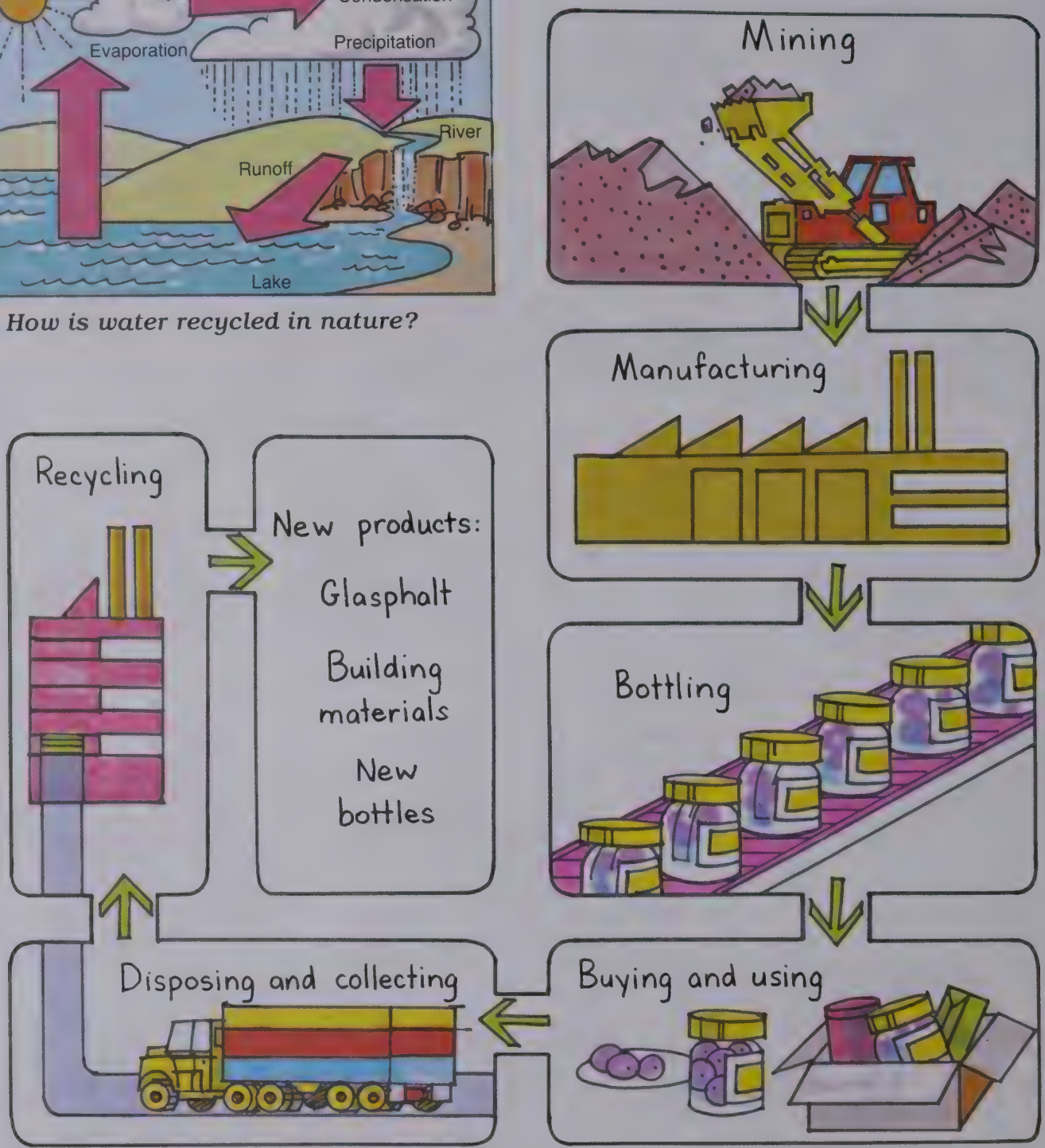
ACTIVITY 9

Conserve by Recycling



How is water recycled in nature?

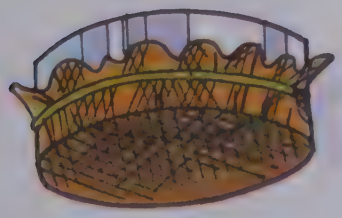
Recycling Glass Jars and Bottles



Recycle Your Own Paper

Each group will need:
- one large, thick newspaper
- 2 tablespoons of starch
- large bowl
- use of an electric or hand beater
- four cans, each with their ends removed
- four old nylon stockings
- four rubber bands
- water

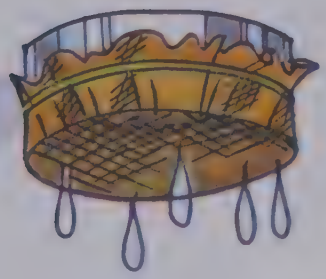
1. Cover your desk with newspaper.
2. Half fill your bowl with water.
3. Tear up several sheets of paper into very, very small pieces.
4. Add these pieces to the bowl until the water has been absorbed by, or sunk into, the paper.
5. Add more water and two tablespoons of starch. Don't fill the bowl too full.
6. Wait one hour.
7. While you are waiting, cut a strip of stocking large enough to fit over one end of your can, like this.



Secure the stocking to the can with the rubber band. Make sure the stocking is stretched tightly.

8. After one hour, take turns beating the mixture you made until you have a pulp. No little bits of paper should be seen.
9. Now, taking turns, place some of the pulp inside your can, like this.

10. Press out as much water as you can over the bowl.



11. When you have enough pulp to cover the base of your can, place it on your desk.
12. With your fingers, make it as flat and smooth as you can.
13. Carefully remove the elastic band and take off the stocking. Place your sheet of paper out to dry.

14. Leave for twenty-four hours.

ACTIVITY 10

Trying to Use Everything: Then

The Plains Indians didn't waste any part of the buffalo. Everything was used for something. Here are some of the things they used.

Horn
used for drinking cups, spoons, clubs, children's tops, tips of sled runners

Blood
put into intestines, cooked, and eaten like sausage

Sinews
used for bowstrings, sewing threads, cord

Hair
used to make balls, paintbrushes, lariats, scarves, belts, headbands, stuffing in saddles, pillows

Brain
used in tanning

Fat
used to make pemmican

Tail
attached to a stick and used as a fly-swatter

Teeth
used for necklaces

Bones
used for scrapers, knives, hoes, awls, sleds, dice, religious ceremonies

Dung
used for fuel

Hide
used to make shields, rattles, saddlebags, shirts, moccasins, floor coverings, robes

Stomach
used as a cooking pot

Bladder
used to make waterproof bags

Hoof
used to make glue

Do you think we get as much from a cow? Find out.

Trying to Use Everything: Now

Have you ever wondered how enormous machines get inside buildings? At the Ontario Centre for Resource Recovery, the machines needed to recycle garbage were put in place *before* the buildings went up.

This is the main shredding machine. You can see it is indeed a large machine by comparing it to the size of the people who are helping to put it in place.

The teeth that you see here belong to one of the many shredding machines in the plant. They grind up solid waste, such as refrigerators and washing machines, to pieces less than 15 cm in size — about the size of your hand.

This photograph shows a glass-grinding machine. If you look closely, you will see the chute that feeds the uncrushed glass into the machine. Crushed glass from this machine is about 2 cm in size — about the size of a mint candy.

Here are other facts about the recycling plant.

1. It cost fifteen million dollars to build.
2. It opened in 1977.
3. The plant recycles 90% of the waste it receives.
4. The following items are sold to manufacturers: baled mixed paper; baled shredded cardboard and paper; bulk crushed glass; bulk ferrous metals — metals containing iron; and, compost.
5. The 10% of the waste it can't handle goes in compact bundles to landfill sites.
6. Twenty-six people operate the plant.
7. The plant is a training ground for people who will be able to manage other recovery plants in the future.

ACTIVITY 11

We Should, But Will We?

Design a campaign (a group of activities with a single purpose) against energy waste in the school or community. The campaign should present positive methods of saving energy. It should include radio and TV advertisements, billboards, magazine articles, public meetings, and posters.

Collect used clothes to donate to a local charity. By doing this, you help other people and you save energy.

Develop a TV quiz show in which people are judged on their energy knowledge. Take questions from what you have already learned about energy. Flip through this book, your Activity Sheets, and your notebook to remind yourself about what you know.

Design an energy-saving product and write a TV commercial for it.

Come up with an idea of your own that deals with saving energy.

ACTIVITY 12

Energy and Automobiles

Cars are a very important part of our life today. We do our shopping in them. We go to work or school in them. We take our holidays in them. We use them to carry our goods from place to place. These are the good things about cars. But there is a bad side too. Cars poison, or pollute, the air. They are dirty and noisy. They use a great deal of oil and gas, which we are fast using up. And, when they "die," they are stacked in ugly heaps all through the country.

It is hard to imagine life without cars. Just a century ago, however, they were unknown. Then, people moved about by horse, stagecoach, train, or penny farthing bicycle. In 1886, Eli Olds began working with steam-powered cars. He was only twenty-two years old at the time. In 1893, he sold a "steamer" to Bombay, India. This was the first car exported from North America.

This car used fire to heat water in a large closed boiler. The steam produced was used to turn a drive wheel which in turn made the wheels go around. These steam cars were noisy and dirty. Hot coals and black smoke poured out of the chimney. This polluted the air and also set fire to fields, wooden bridges, and the passengers' clothing.

"Steamers" frightened horses and were dangerous to walkers. In England, their speed was limited to 6.4 km/h in the country and 3.2 km/h in towns and cities. Another law said someone had to walk in front of the car carrying a red flag during the day and a red lantern at night. This was to warn walkers and people riding horses that the car was coming. The warnings gave them time to get out of the car's way.

Soon gas cars replaced steam cars. In 1901, Olds began to make the Oldsmobile. He built the first car factory in North America and sold his cars for $650.

Henry Ford wanted to make a car that everyone could afford to buy. In 1908, he built the first Model T. It cost $850, but this price was still too high for most people. In 1913, Ford put a moving assembly line in his plant. Cars could now be made more quickly and with less work. The frame of the car moved through the plant while workers attached parts to it. Each person did one job. Each new car took just over ninety minutes to make and cost only $400.

This new way of making cars, by mass-producing them, meant that almost everyone could afford to buy one. The car age had begun. With it came a demand for oil. The first money-making oil well in North America was drilled in Canada. It was drilled at Oil Springs, close to Hamilton, Ontario, in 1858. Soon other oil wells helped supply the demand for gasoline.

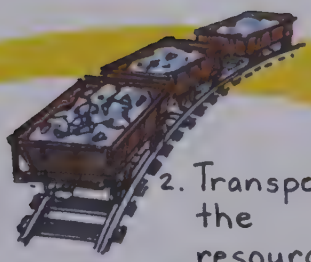
As the demand for cars grew, car makers hurried to supply more and more cars. More and more energy was used to make steel for car bodies. More and more gasoline was used to power the cars. More and more car graveyards sprang up in the countryside. The air became dirtier and the noise level rose with the number of cars. As cars increased, so did the number of problems we had to solve.

Answer these questions:

1. List some of the good things about modern cars.
2. What was a "steamer?" How did it work?
3. List as many problems as you can that were caused by the "steamer."
4. How did Henry Ford lower the price of his Model T?
5. What effect did lower car prices have on life in North America?
6. According to the story, what other new industry did the car industry help start?
7. List some of the problems that cars give us today.

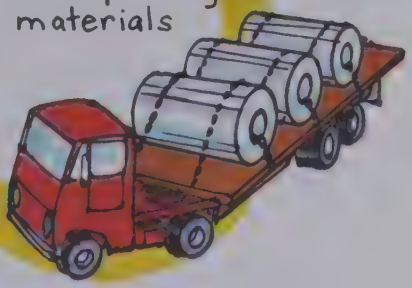
The Life of a Car

1. Obtaining the natural resources

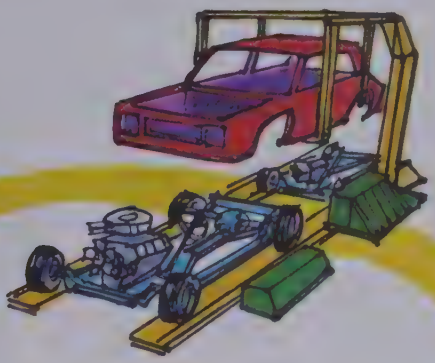


2. Transporting the resources

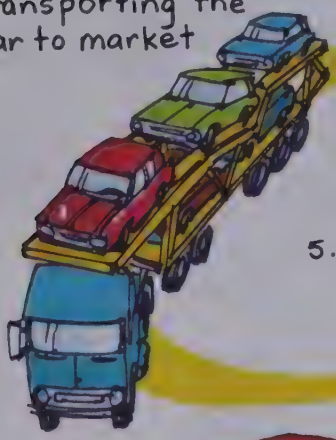
3. Refining the resources



4. Transporting refined materials

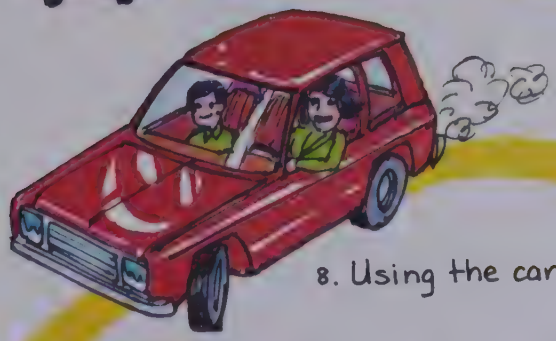


5. Manufacturing the car



6. Transporting the car to market

7. Selling and distributing the car at a new-car dealership



8. Using the car

9. Fueling the car

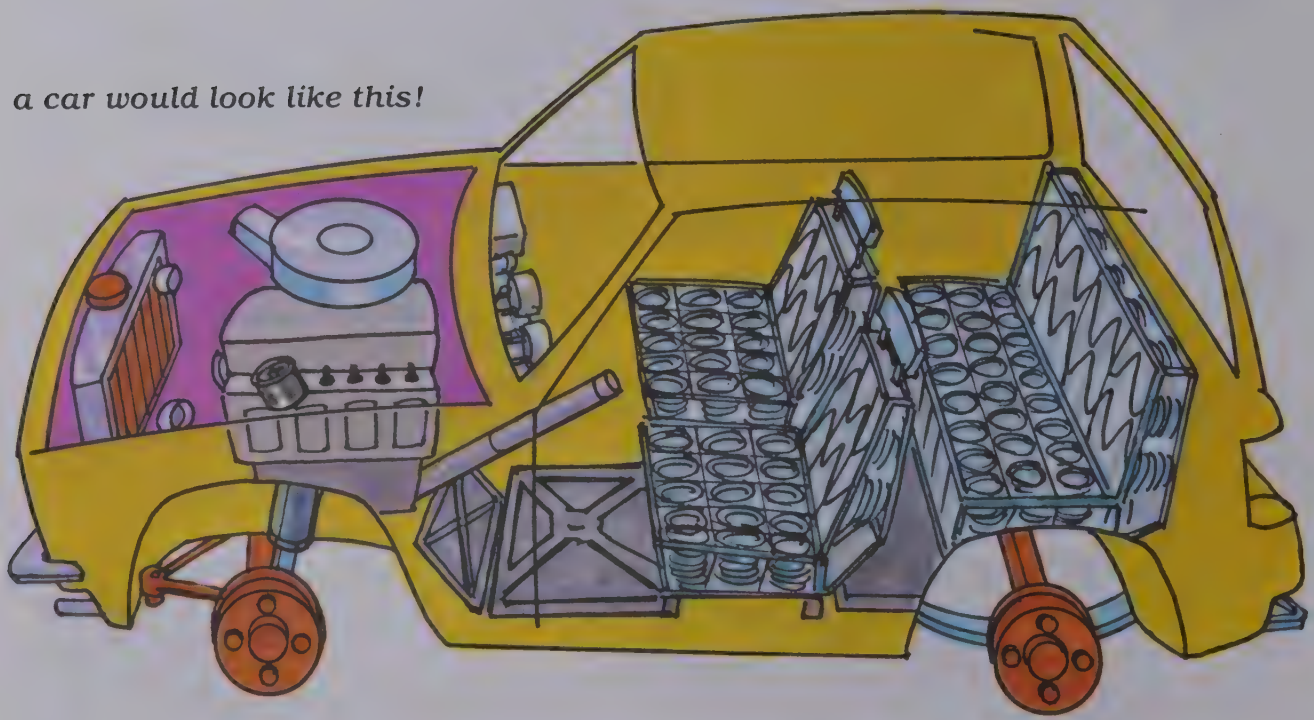
10. Disposing of the car at the end of its usefulness

ACTIVITY 13

Energy Users in Car Manufacturing

Without petrochemicals —

a car would look like this!

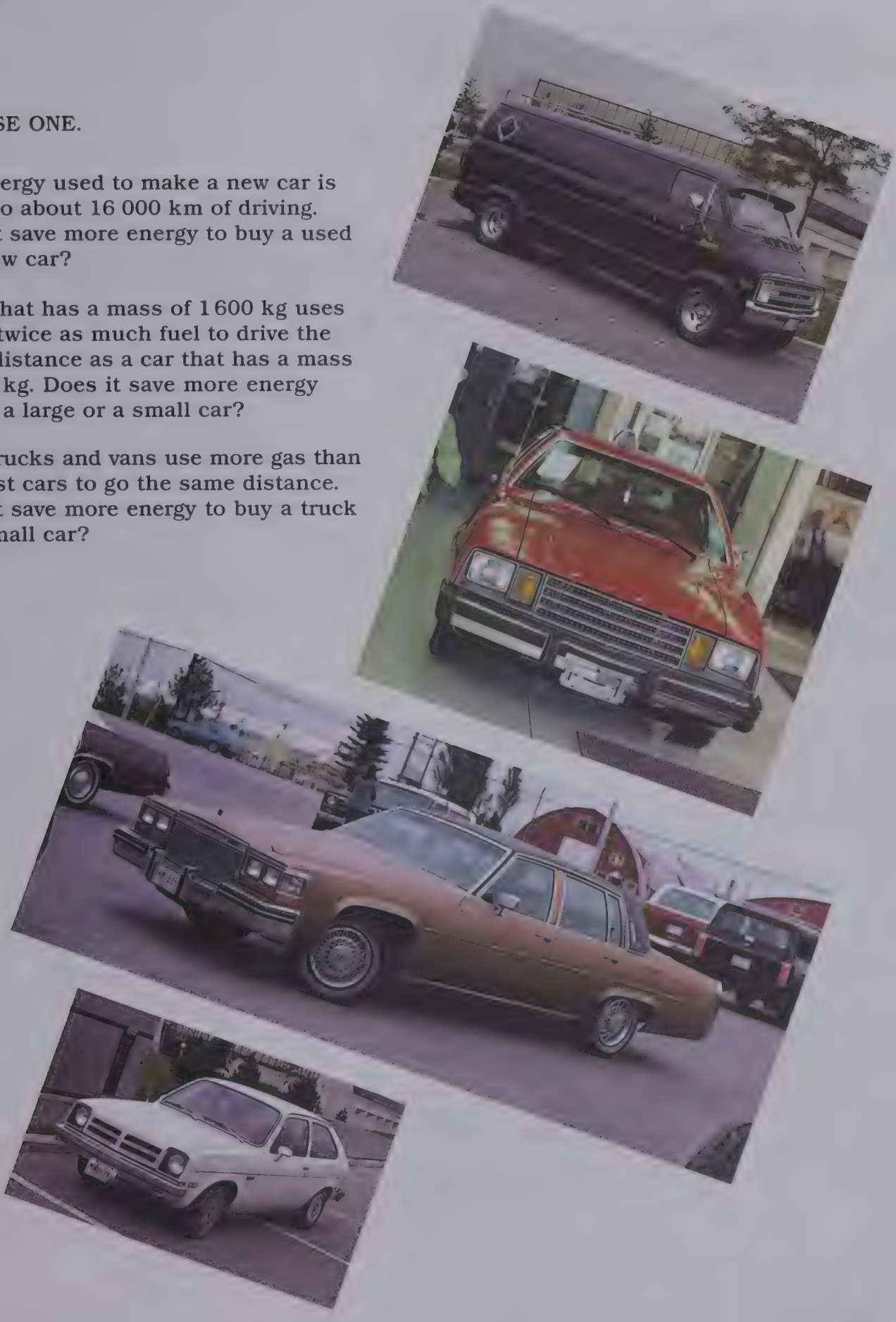


CHOOSE ONE.

The energy used to make a new car is equal to about 16 000 km of driving. Does it save more energy to buy a used or a new car?

A car that has a mass of 1 600 kg uses about twice as much fuel to drive the same distance as a car that has a mass of 800 kg. Does it save more energy to buy a large or a small car?

Most trucks and vans use more gas than do most cars to go the same distance. Does it save more energy to buy a truck or a small car?



ACTIVITY 14

Air Pollution from Automobiles

What is wrong here?

What Effects Do Cars Have on Our Air?

Have you ever wondered why the air in the country is cleaner than the air in the city? Have you ever wondered about the harmful things there might be in the air we breathe? Many of these harmful things come from cars. Some of them come from our cars' exhaust pipes. Some come from the factories where the cars are made.

When we burn fossil fuels to make energy, we pollute the air by adding extra things to it. About 60% of all air pollution in North America comes from gasoline engines in cars. In large cities, the amount of air pollution caused by cars may be as much as 85% of all air pollution. The gases from cars usually remain in the air.

Cars cause problems because they run on gas and oil. These fuels are called "nonrenewable" because once we use them they're gone. They cannot be replaced. These fuels create poisonous gases when they are burned. Car makers are trying to develop cars that use less fuel and create fewer fumes.

How are these gases harmful to us? One of the gases is carbon monoxide. It is a poisonous gas that cannot be seen or smelled. When we breathe this gas, it affects our blood in such a way that it cannot carry enough oxygen. The gas stops the oxygen from reaching the brain. Thus, breathing a very small amount of carbon monoxide can be very harmful.

Hydrocarbons form another type of gas that comes from gasoline engines. These may cause cancer in those who breathe them.

Nitrogen oxides are a third type of gas. They can kill plants and cause lung disease in people.

Lead is a fourth poison that pollutes the air when leaded gas is burned for fuel. Lead can cause headaches, illness, blindness, even death if too much of it collects in our bloodstream.

Today, we are trying many ways to lessen the problems caused by cars. New cars have special parts that reduce the amount of gases sent into the air. Governments have made laws that help to control air pollution. Drivers can also help. If people kept their engines working properly, there would be less air pollution. When people drive at low speeds, they again help reduce air pollution.

Exercise A

In your notebook, write the numbers 1-5. Write each number on a separate line. Complete each of the following statements by writing the word that fits the number. Choose from the words listed on the next page. Two of the

words will *not* be used. Car, carbon monoxide, exhaust pipe, fossil fuels, lead, nitrogen oxides, pollution.

1. Harmful gases are added to the air when we burn _____.
2. The largest cause of air pollution is the _____.
3. Dangerous gases from a car come from the _____.
4. An example of a dangerous gas that has no smell and is also invisible is _____.
5. A group of gases that can cause lung disease and kill plants is called _____.

Exercise B

1. What does "air pollution" mean?
2. How is the burning of fossil fuels harmful to the air?
3. Name the four main gases given off by a gasoline engine.
4. How are new cars better able to reduce air pollution than old cars?
5. How are governments helping to reduce pollution?
6. Name two ways car owners can decrease the amount of air pollution.

ACTIVITY 15

What Can We Do With Old Cars?

What could you do with one of these?

ACTIVITY 16

The Automobile and the Environment

The Daily Press

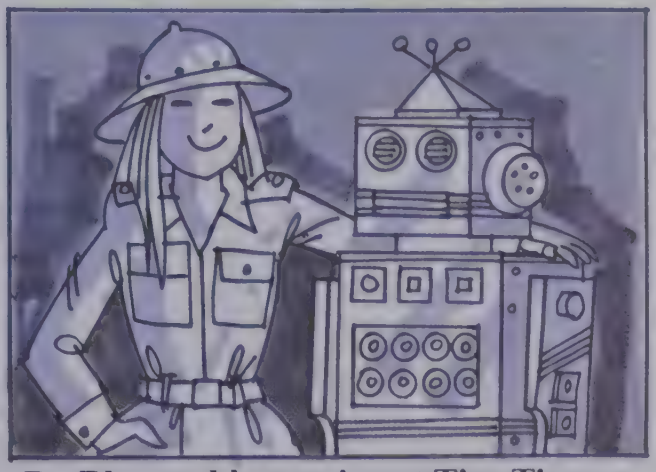
JANUARY 27, 2085

Major discovery by famous Dr. Blue

SMITH JUNCTION (SRA). The famous anthropologist, Dr. Blue, has made a major find. In her most recent dig, Dr. Blue found the bodies of metal creatures. She thinks that the creatures roamed the earth in the twentieth century. They were called "autosaurs." They had a mass of between 1 800 and 2 800 kg and could travel at great speeds.

The people of the time trained the autosaurs and depended greatly on them. They used them to transport people and goods from place to place. The people lived in huge, sprawling places called "cities." Without the autosaur, travel in these cities was not practical. The autosaur was used for visits to friends, for going to work, and for holiday trips. It also carried the things these people needed to live, such as food, clothing, and materials for shelter.

Often the people lost control of the autosaurs. Each year thousands of the people lost their lives to autosaurs. These creatures made such a racket that after a while the people could not stand the noise. As well, the autosaurs' strange breath poisoned the air.



Dr. Blue and her assistant, Tina Tinware

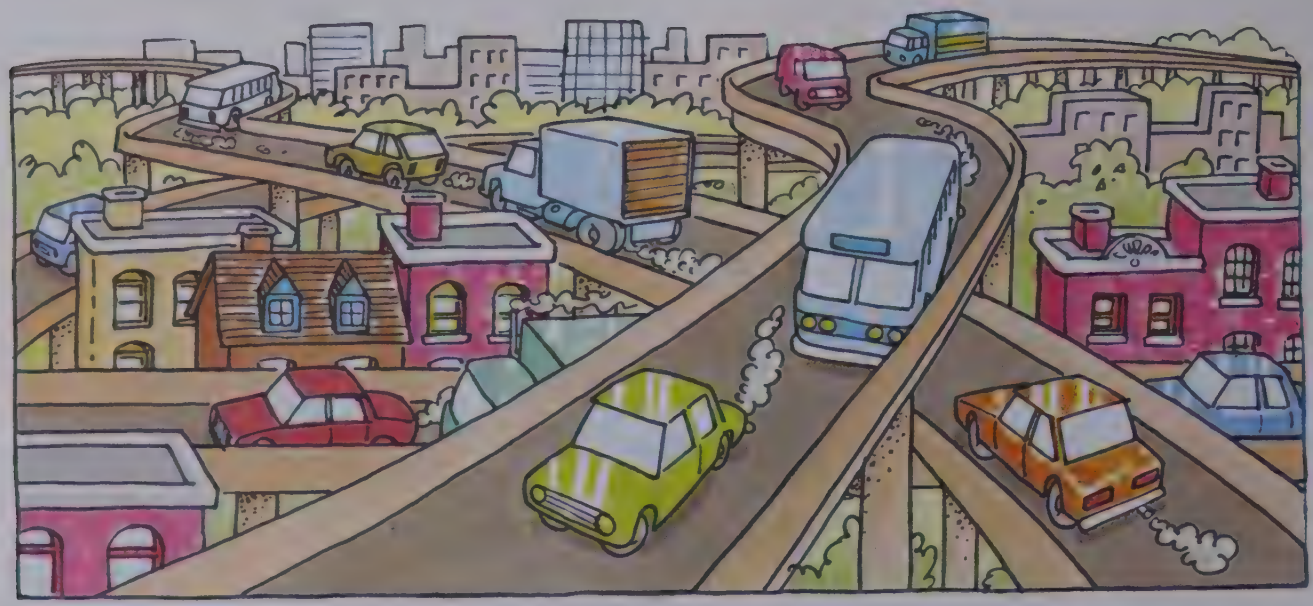
These creatures used pathways called "roads." The roads gobbled up large amounts of land that could have been used for such things as growing food. Often so many of these autosaurs used the roads that they were stopped for hours. These were called "traffic jams." When the creatures finally died, their bodies were collected in piles and left at a local dump.

By the end of the twentieth century, the autosaurs mysteriously disappeared. A picture found near one of the cities shows great numbers of autosaurs lined up at a "feeding station." A youth is force-feeding an autosaur by putting a hose into its small mouth. No food can be seen coming out. Dr. Blue thinks that the autosaurs may have starved to death due to the loss of their food supply.

This article is a "read-between-the-lines" story. It is not what it appears. Did you get the point?

Try these questions. Write the lettered portion that makes the statement correct.

1. We know this article is not a true story because
   A of the date
   B there are no such people as anthropologists
2. This article is based on
   A facts
   B the writer's imagination
3. The autosaur appears to remind the author of extinct
   A mammoths
   B dinosaurs
4. The autosaur in this story is actually
   A an automobile
   B a living creature still around today
5. An autosaur of 1 800 kg is actually
   A a large animal
   B a car
6. The strange breath of an autosaur actually comes from
   A the back of the autosaur
   B the exhaust pipe of a car
7. The feeding station in the article is
   A a gas station
   B the local zoo
8. If you read "between the lines," autosaurs became extinct because people
   A had used up all the fossil fuels
   B refused to feed them



1. Over 25% of the land in large cities is used for cars.
2. Automobiles account for about 15% of our energy needs and use over 30% of our annual gas supplies.
3. Automobiles are the major contributors to air pollution.
4. Slower highway speeds save lives and energy.
5. The cost of owning a car can be as much as $3 000 a year.
6. Almost half of the cars inspected in two large cities were in need of repair.
7. A properly maintained car uses up to 15% less fuel than a car of the same year and make that is not properly maintained.

ACTIVITY 17

How Your Family Uses the Car

Car Wastes

For every litre of gasoline burned, the average car produces:

- 300 g of carbon monoxide (a poisonous gas)
- 55 g of hydrocarbons (harmful solids, liquids, and gases)
- 5 g of nitrogen oxides (poisonous gases)
- 1.3 g of lead (poisonous solid formed from leaded gas)
- 1.3 g of sulfur oxide (a poisonous gas)

1. In one week, how many litres of gas did your family's car(s) use?
2. Was the gas leaded or nonleaded?
3. Find out how many grams of each of the following your car may have produced:
   - carbon monoxide
   - hydrocarbons
   - nitrogen oxides
   - lead
   - sulfur oxide

ACTIVITY 18

Alternatives

1. Name some vegetables that can be grown in your area. (Below are four methods of preparing these vegetables.)
2. Which method uses the least energy?
3. Which method uses the most energy?
4. Which method uses the least packaging?
5. Which method uses the most packaging?
6. Which methods can your family use in the summer?
7. Which methods can your family use the rest of the year?

Method 1

1. You grow a vegetable in your own garden.
2. You pick it.
3. You eat it raw.

Method 2

1. You grow a vegetable in your own garden.
2. You pick it.
3. You cook it.
4. You eat it.

Method 3

1. Someone else grows a vegetable.
2. It is harvested.
3. It is transported to market.
4. It is refrigerated at the market.
5. You drive to the market and buy it.
6. You take it home and cook it.
7. You eat it.
8. You throw away the package.

Method 4

1. Someone else grows a vegetable.
2. It is harvested.
3. It is transported to a processing plant.
4. It is sliced by a machine.
5. It is packaged.
6. It is frozen.
7. A refrigerated truck takes it to market.
8. At the market, it is kept frozen.
9. You drive to the market and buy it.
10. You take it home and put it in the freezer.
11. You thaw it and cook it.
12. You eat it.
13. You throw away the package.

ACTIVITY 20

Cracking the Code

In your notebooks, copy the code and its numbers as you see them here.

When we can, we should

1	2	3	4	5	6		7	8	9	10	11		12	13	14	15	16	17	18
T	G	F	W	E	G,		T	G	W	U	G,		T	G	E	A	E	N	G

To solve the code, read each pair of sentences. Decide which of the two sentences is true. Put the letter that follows the true statement under the code letter you have written.

1. One reason foods are processed is that processing helps to preserve them. **R**
   Frozen vegetables are examples of dehydrated foods. **A**
2. The energy used to package and process foods may be greater than the energy in the foods. **E**
   Pemmican is a processed food in great demand today. **K**
3. All our solid waste is incinerated. **P**
   We would reduce litter if we used only returnable containers. **D**
4. All frozen vegetables are "lye-peeled." **R**
   According to the food-processing industry, 70% of its waste is recycled. **U**
5. Sanitary landfill is one way we dispose of our garbage. **C**
   Sanitary-landfill sites can be landscaped into parks within ten years. **E**
6. A recycled item takes its original form. **S**
   We conserve energy if we reuse items. **E**
7. A compost heap is a good way to recycle some forms of garbage. **R**
   The words *reuse* and *recycle* have the same meaning. **I**
8. Most breakfast cereals use too much packaging. **E**
   Frozen french fries use too much packaging. **N**
9. Cars were more popular a century ago than they are today. **L**
   World oil prices are forcing us to be more energy-conscious. **U**
10. Henry Ford first used a moving assembly line. **S**
    Eli Olds made the car that everyone could afford to buy. **A**
11. Steam cars replaced gas cars. **T**
    The car age created a demand for oil. **E**
12. Four people in a car use less energy than four people on bicycles. **V**
    Trucks and vans use more energy than cars. **R**
13. Carbon monoxide has a very disagreeable smell. **W**
    A small amount of carbon monoxide gas can be harmful to us. **E**
14. Fossil fuels are nonrenewable energy sources. **C**
    Petroleum is a renewable energy source. **P**

15. Automobiles are a major source of air pollution. **Y**
Nothing is being done to reduce air pollution. **E**

16. Over 25% of the land in large cities is used for cars. **C**
Every adult needs a car. **R**

17. Killer smogs have been reported in rural areas. **S**
Cars contribute to noise pollution. **L**

18. Pioneers used large amounts of nonrenewable energy sources. **H**
There will come a time when we have used up our nonrenewable energy sources. **E**

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